REMARKS

Reconsideration and withdrawal of the rejections set forth in the Office Action dated January 8, 2010, are respectfully requested in view of this Response. Claims 1, 4-6, 8, 9, 12, 16, 18, 20-35, 37 and 39-45 are pending in this application. Claim 36 is hereby canceled without prejudice or disclaimer, for the sole purpose of advancing prosecution. Claims 44 and 45 are newly presented.

In the outstanding Office Action, the Examiner rejected claims 1, 4, 5, 12, 16, 20, 23 and 41 under 35 U.S.C. §103(a) as being assertedly unpatentable over U.S. Patent No. 6,858,846 to Hjertman et al. (hereinafter referred to as "Hjertman et al."); rejected claims 8, 9 and 18 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of U.S. Patent No. 6,372,895 to Bentsen et al. (hereinafter referred to as "Bentsen et al."); rejected claim 6 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of PCT Publication WO 03/023379 to Tokhtuev et al. (hereinafter referred to as "Tokhtuev et al."); rejected claims 21 and 22 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of U.S. Patent No. 3,666,945 to Früngel et al. (hereinafter referred to as "Früngel et al."); rejected claims 24-26, 39, 40 and 42 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of U.S. Patent No. 6,121,053 to Kolber et al. (hereinafter referred to as "Kolber et al."); rejected claims 27-30 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of U.S. Patent No. 4,496,839 to Bernstein et al. (hereinafter referred to as "Bernstein et al."); rejected claim 31 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of U.S. Patent No. 6,157,033 to Chudnovsky (hereinafter referred to as "Chudnovsky"); rejected claim 32 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of U.S. Patent Application Publication No. 2005/0174793 to Field (hereinafter referred to as "Field"); rejected claim 33 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of U.S. Patent No. 3,554,653 to Zielke et al. (hereinafter referred to as "Zielke et al."); rejected claim 34 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. as modified by Kolber et al. as applied to claim 24, and further in view of U.S. Patent No.

4,005,605 to Michael (hereinafter referred to as "Michael"); rejected claim 35 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. as modified by Bentsen et al. as applied to claim 18, and further in view of Chudnovsky; rejected claims 36 and 37 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of U.S. Patent No. 5,947,051 to Geiger (hereinafter referred to as "Geiger"); and rejected claim 43 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. as modified by Kolber et al. as applied to claim 42, and further in view of Früngel et al.

Claims 1 and 42 have been amended without prejudice or disclaimer for the sole reason of advancing prosecution. Claims 32-34 have been amended to correct a typographical error; claim 37 has been amended to revise the dependency of the claim from canceled claim 36 to new claim 44. Applicants reserve the right to reassert the original claim scope of any claim in a continuing application. The amended claims are fully supported throughout the claims, specification and figures as originally filed. Applicants respectfully submit that the amendments introduce no new matter within the meaning of 35 U.S.C. § 132.

Applicants request reconsideration and timely withdrawal of the pending rejections for at least the reasons discussed below.

Claim Rejections under 35 U.S.C. §103(a)

The Examiner rejected claims 1, 4, 5, 12, 16, 20, 23 and 41 under 35 U.S.C. §103(a) as being assertedly unpatentable over U.S. Patent No. 6,858,846 to Hjertman et al.; rejected claims 8, 9 and 18 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Bentsen et al.; rejected claim 6 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Tokhtuev et al.; rejected claims 21 and 22 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Früngel et al.; rejected claims 24-26, 39, 40 and 42 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Kolber et al.; rejected claims 27-30 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Bernstein et al.; rejected claim 31

under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Chudnovsky; rejected claim 32 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Field; rejected claim 33 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Zielke et al.; rejected claim 34 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. as modified by Kolber et al. as applied to claim 24, and further in view of Michael; rejected claim 35 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. as modified by Bentsen et al. as applied to claim 18, and further in view of Chudnovsky; rejected claims 36 and 37 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. in view of Geiger; and rejected claim 43 under 35 U.S.C. §103(a) as being assertedly unpatentable over Hjertman et al. as modified by Kolber et al. as applied to claim 42, and further in view of Früngel et al.

Response

Applicants traverse the rejections as all of the features of the presently claimed subject matter are not disclosed, taught or suggested by the cited prior art of record. To establish a *prima facie* case of obviousness, the Examiner must establish that the prior art references teach or suggest all of the claim features. *Amgen, Inc. v. Chugai Pharm. Co.*, 18, USPQ2d 1016, 1023 (Fed. Cir. 1991); *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); *In re Wilson*, 165 USPQ2d 494, 496 (CCPA 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. *See Dystar Textilfarben GMBH v. C. H. Patrick*, 464 F.3d 1356 (Fed. Cir. 2006). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. *Id.* at 1366.

<u>Overview</u>

Hjertman et al. describes "a method for operating a preparation delivery device wherein

the device comprises a) a container for the preparation having, or being prepared for the arrangement of, an opening, b) a mechanism operable to deliver at least part of the preparation in the container through the opening, c) attachment means for connection of the container to the mechanism and d) a sensor system arranged to detect at least one predetermined property of the container or its content. The method comprises transmitting radiation towards the container position or a part thereof to allow the radiation to be affected by the container position, receiving at least a part of the affected radiation from at least an area part of the container position in a non-imaging way and comparing the characteristics of the received radiation with a predetermined characteristic representative for the predetermined property to establish whether or not the predetermined property of the container is present." *See* Hjertman et al. Abstract.

Bentsen et al. describes "novel coumarin based fluorogenic compounds useful in assaying for biological activity. Specifically, these fluorogenic compounds exhibit fluorescence at particular wavelengths when cleaved by target enzymes. Preferred compounds include sugar and peptide derivatives of umbelliferone derivatives bearing a heterocyclic five membered ring at the 3-position. These compounds can be used for rapidly detecting food pathogens and for determining sterilization effectiveness. The compounds may also be used in a form bounded to a polymeric support or to a biomolecule or macromolecule." *See* Bentsen et al. Abstract.

Tokhtuev et al. describes "[a] multichannel fluorosensor (100) includes an optical module (1) and an electronic module (7) combined in a watertight housing (101) with an underwater connector (102). The fluorosensor (100) has an integral calibrator for periodical sensitivity validation of the fluorosensor (100). The optical module (1) has one or several excitation channels (5, 6) and one or several emission channels (3, 4) that use a mutual focusing system (2). To increase the efficiency of this mutual focusing system (2), the excitation and emission channels each have a micro-collimator made with one or more ball lenses (22). Each excitation channel has a light emitting diode and an optical filter. Each emission channel has a photodiode with a preamplifier and an optical filter. The electronic module (7) connects directly to the optical module (1) and includes a lock-in amplifier, a power supply and a controller ii**I** with an A/D converter and a connector." *See* Tokhtuev et al. Abstract.

Früngel et al. describes "[a]n arrangement through which the concentration of fluorescent materials, when present in low quantities, may be measured within a fluid. A transmitter is flashed periodically at a rate corresponding to the rate that measurements are taken, for the purpose of exciting the fluorescent materials. Filters and optical systems are provided at the transmitter for transmitting the appropriate light. A receiver spaced from the transmitter or light source is also equipped with appropriate filters and optical systems, and receives on a photosensor, the radiation from the fluorescent materials. The resultant electrical signals from the photosensors are amplified and compensated against daylight and cloudy effects of the medium, through an auxiliary amplifier." *See* Früngel et al. Abstract.

Kolber et al. describes that "[a] multiple protocol fluorometer measures photosynthetic parameters of phytoplankton and higher plants using actively stimulated fluorescence protocols. The measured parameters include spectrally-resolved functional and optical absorption cross sections of PSII, extent of energy transfer between reaction centers of PSII, F_0 (minimal), F_m (maximal) and F_v (variable) components of PSII fluorescence, photochemical and non-photochemical quenching, size of the plastoquinone (PQ) pool, and the kinetics of electron transport between Q_a and PQ pool and between PQ pool and PSI. The multiple protocol fluorometer, in one embodiment, is equipped with an excitation source having a controlled spectral output range between 420 nm and 555 nm and capable of generating flashlets having a duration of 0.125-32 μs, an interval between 0.5 μs and 2 seconds, and peak optical power of up to 2 W/cm^2. The excitation source is also capable of generating, simultaneous with the flashlets, a controlled continuous, background illumination." *See* Kolber et al. Abstract.

Bernstein et al. describes "a system and method for remote detection and identification of unknown chemical species in gaseous, aerosol, and liquid states. A pulsed infrared laser is directed at an unknown chemical mass which absorbs energy at the laser wavelength. Due to molecular energy transfer processes, the absorbed laser energy can be re-emitted in one or more wavelength regions nonresonant with the laser wavelength. The re-emitted energy is detected for a period of time which is comparable to or less than the characteristic time for the absorbed radiative energy to be dissipated as heat. The nonresonant infrared emission spectrum of the

unknown chemical species is detected with several infrared detectors. The identity of the unknown species, as well as its range and concentration, may be established by comparison of its spectrum to that for known species." *See* Bernstein et al. Abstract.

Chudnovsky describes "[a] method and apparatus for remote detection of gas leak and determination of the relative concentration of a gas using nondispersive infrared absorption of backscattered laser light with background compensation. The method includes source of coherent infrared radiation, sealed reference cell, filled with air with admixture of reference gas of known concentration, sealed control cell filled with air, sensitive elements which are sensitive to radiant fluxes in a determined band of wavelengths. The method includes measuring output signals, calculating the difference of the signals from control cell for different points, the difference of signals from reference cell and control cell, the ratio of said differences and relative concentration, and means for converting said concentration into visual image and audio signal. The apparatus includes camera or video camera to record a visual image of an object at the point where the maximum relative concentration was recorded and laser pointer to indicate a position of invisible infrared beam on a target." *See* Chudnovsky.

Field describes "[a]n automotive headlight assembly includes a concave parabolic reflector having a focal axis and a focal point on the axis spaced from the reflector surface. A halogen light source is mounted on an elongated tubular conduit that is oriented on the focal axis of the parabolic reflector. A power mechanism is connected to the tubular conduit for sliding the conduit through a clearance opening aligned with the focal axis, so that the light source is moved between a high beam position on the focal point and a low beam position located at a different point the focal axis, through an infinite number of in between positions, thus allowing the driver to adjust the focal point of the light to any desired distance." *See* Field Abstract.

Zielke et al. describes that "[a]n improved autocollimator employs a pair of modulated light sources and a pair of plane reflecting surfaces to direct the light out through an objective lens. Between the reflecting surfaces is a window or slit, and behind the slit a light sensor. The purpose of the autocollimator is to direct light onto an external reflector and measure sensitively the direction of the reflection. The reflected light reenters the objective and forms an image

which may fall centered on the slit or may fall displaced with respect to the slit. The displacement of the image is a measure of the angular deviation of the returning light beam and is displayed on a zero-center indicator controlled by the light sensor through phase-sensitive circuitry." *See* Zielke et al. Abstract.

Michael describes that "[a] radiation detector senses ambient radiation within the cavity of an instrument, and then radiation from a target object, the sensed radiation from within the cavity following substantially the same optical path within the instrument as the radiation from the target object, thus minimizing error due to internal cavity temperature and other disturbances during measurement of radiation from the target object." *See* Michael Abstract.

Geiger describes "[a]n underwater self-propelled surface-adhering robotically operated vehicle capable of being navigated through a volume of water and of adhering itself to an underwater surface and traversing along the surface. The vehicle has a main body with an interior suction chamber and a motor driven impeller disposed in the chamber to draw water through the bottom end of the chamber and expel it at the top end and thereby create a negative pressure force at the bottom end to maintain the vehicle in contact with the underwater surface. Thrusters on the main body allow the vehicle to be driven through a volume of water before and after attachment to the underwater surface as well as to hold station in mid water for tasks and inspections. The vehicle may be provided with an evacuable enclosure to provide an environment for task accomplishment and with measurement and inspection devices and tools for underwater hull cleaning, welding, and other underwater tasks." *See* Geiger Abstract.

Independent claim 1 recites [a] fluorometer for detecting the level of fluorescent material in a body of water, the fluorometer comprising:

> an excitation system including an excitation source for producing excitation light capable of causing fluorescence in fluorescent material; and
>
> a detection system for detecting said fluorescence, wherein
>
> *said excitation system comprises an excitation source comprising one or more light emitting diodes (LEDs)*, the excitation system further comprising *means to cause said excitation light to form, in use, a generally conical divergent beam projecting from the fluorometer, said beam causing means comprising at least one collimating lens*, said excitation system further including means for modulating said beam with a modulating signal having a

> modulating frequency, and wherein
>
> said detection system comprises means for receiving light and for converting said received light into a corresponding electrical signal, and at least one lens arranged to direct said received light onto said light receiving and converting means, wherein said at least one lens of the detection system is arranged to provide a generally conical convergent detection volume for the detection system, said generally conical detection volume converging in a direction towards said fluorometer and at least partially overlapping with said generally conical divergent beam and wherein
>
> said detection system further includes means for detecting, in the electrical signal produced by said light receiving and converting means, a signal component of substantially the same frequency as said modulation frequency, said detecting means including *means for performing spectral analysis of said electrical signal and means for determining the value of a spectral component of said electrical signal corresponding to said modulation frequency*,
>
> wherein *said detection system is arranged to determine the level of fluorescent material present in said body of water depending on said value of said spectral component*, such that *the fluorometer is capable of detecting fluorescent material located remotely from the fluorometer in said body of water.*

Emphases added.

Rejection of claims 1, 4, 5, 12, 16, 20, 23 and 41

Firstly, none of the cited prior art uses an LED light source to detect the level of fluorescent material and a body of water remotely from a fluorometer. Unlike a laser excitation source, the LED's facilitate the creation of a generally conical divergent excitation beam as recited in claim 1. This allows the fluorometer to maintain a relatively large detection area extending remotely from the fluorometer (unlike the prior art). However, one having ordinary skill in the art would not normally consider using LED's when detecting fluorescence remotely from a fluorometer because the levels of fluorescence caused at relatively *large* distances from the fluorometer would be relatively *low*. Applicants have found that in order to increase the detection range of a fluorometer while maintaining a relatively large detection area, a combination of features are required:

i. an LED excitation source;
ii. at least one collimating lens;
iii. a generally conical divergent excitation beam;
iv. a generally conical convergent detection volume;
v. modulation of the excitation beam and corresponding spectral analysis of the received signals; and
vi. determining the level of fluorescent material present in the body of water depending on the value of the spectral component corresponding to the modulation frequency.

All of these features are recited in the independent claims, and they all make an important contribution to reliably detecting levels of fluorescent material at relatively large distances from the fluorometer while maintaining a relatively large detection area. Applicants particularly note that <u>none</u> of the prior art devices are capable of detecting fluorescence at a distance of up to several meters from a fluorometer while maintaining a relatively large detection volume (any of the prior art that uses LED's as a light source can only detect fluorescence adjacent the fluorometer, while those prior art devices that can measure fluorescence at distances of up to several meters from the fluorometer do so using a laser and therefore sacrifice having a relatively large detection volume.) For example, with Hjertman et al., the transmitter and receiver 6 and 8 only detect fluorescence immediately in front of the receiver/transmitter (see Figure 1a).

Applicants also agree with the Examiner that Hjertman et al. does not disclose a collimating lens used in conjunction with an LED light source. *See* Office Action page 4, first paragraph. However, Applicants respectfully disagree that "[i]t would have been obvious to one of ordinary skill in the art... to use a collimating lens with the excitation source of Hjertman..." (to create an asserted diverging beam for Hjertman et al.) since there would be <u>no</u> reason, incentive or motivation for Hjertman et al. to make the Examiner asserted modification. In particular, the target for Hjertman et al.'s beam label **5** is *very close* to the transmitter **6**, and so a collimating lens would have <u>no appreciable effect</u> on the performance of Hjertman et al.'s apparatus. Applicants refer the Examiner to (the Examiner cited passage of) Hjertman et al. col. 12, lines 7-11 in which Hjertman et al. *does* consider the use of a collimator lens but <u>only</u> for the production of a *parallel* beam and explicitly <u>not</u> for creating a *divergent* beam. Instead, Hjertman

et al. refers specifically to a "plain diffuse transmitter… or a lens system" for creation of a divergent beam.

Applicants also respectfully disagree with the Examiner that Hjertman et al. discloses "means for performing spectral analysis of said electrical signal and means for determining the value of a spectral component of said electrical signal corresponding to said modulation frequency." The Examiner has cited Hjertman et al. col. 12, lines 39-51 in this regard. However, this passage of Hjertman et al. *merely* describes "that a spectroscopic analysis of, *for example*, container content *is possible*" and <u>not</u> spectral analysis of the electrical signal produced by the light receiving and converting means. Notably, Hjertman et al. has <u>no need</u> whatsoever to perform a "spectral analysis of said electrical signal" or to determine "the value of the spectral component of said electrical signal corresponding to said modulation frequency" as claimed. Instead, Hjertman et al. uses modulation as a means of excluding "influence from random factors and disturbances not having the modulated characteristic." *See* Hjertman et al. col. 21, lines 1-5. This exclusion *via* modulation is achieved by tuning the receiver to the modulation frequency (*see* Hjertman et al. col. 21, lines 12-13) or, in the case when Hjertman et al. is trying to detect fluorescence, by tuning the receiver to the expected frequency of the fluorescence (*see* Hjertman et al. col. 10, lines 35-37). The tuning itself is achieved by filtering (*see* for example Hjertman et al. col. 22, lines 18-20 and "bandpass filter **37**" of Hjertman et al. Figure **3**).

Hjertman et al. then compares the received and filtered signal against reference levels in order to assess what, if anything, has been detected. This is because the principle behind Hjertman et al.'s invention is that the received radiation will be affected in some detectable way by being reflected, scattered or absorbed by the container or its contents (*see* for example Hjertman et al. col. 12, lines 14-17 and col. 17, lines 15-19).

Hence, Hjertman et al. has <u>no need</u> to perform a spectral analysis of the electrical signal since the received radiation is *already known* to be in the desired frequency band in view of Hjertman et al.'s filtering design.

Additionally, Applicants respectfully submit that with respect to the fluorometer of claim 1, the purpose of determining the value of the spectral component of said electrical signal corresponding to the modulation frequency is to allow the device of claim 1 to determine the level of fluorescent material present in a body of water. Claim 1 has been amended to state this more clearly. In contrast, Hjertman et al. only uses fluorescence as a *marker*; this fluorescence causes a change in frequency in the received radiation and thus, by detecting this change in frequency, Hjertman et al. detects the fluorescence marker. *See* Hjertman et al. col. 12, lines 48-51 and col. 10, lines 35-37.

However, Hjertman et al. is <u>not</u> at all concerned with detecting the *level* of fluorescent material present in a body of water, or in anything else (i.e. *any* container). In contrast, the device of claim 1 "*is arranged to determine the level of fluorescent material present in said body of water* depending on said value of said spectral component, *such that the fluorometer is capable of detecting fluorescent material located remotely from the fluorometer* in said body of water" (emphases added). Even if the levels of fluorescence are small, the fluorometer of claim 1 is able to detect fluorescence *levels* by means of a combination of features, including "means for performing spectral analysis of said electrical signal" and "determining the value of a spectral component of said electrical signal corresponding to said modulation frequency," and using said value to determine the detected level of fluorescent material.

Lastly, in further contrast, it can be seen from Figure **1a** of Hjertman et al. and the accompanying description that most of the radiation received by Hjertman et al.'s receiver **8** is *reflected* or *scattered* radiation that has emanated from the transmitter **6**. In contrast, because the fluorometer of claim 1 is detecting fluorescent material *remotely*, any radiation received by the fluorometer of claim 1 will <u>not normally</u> be the reflected excitation beam. Instead it will be a *relatively weak* fluorescent light that can be detected at the modulation frequency in the manner described in claim 1. Hjertman et al. <u>is not capable</u> of performing this task because it is configured to detect changes in the reflected or scattered excitation beam, as described above.

Accordingly, claim 1 is novel, unobvious and patentable over Hjertman et al. by virtue of *at least* the following features:

> A. claim 1 recites a fluorometer for detecting the level of fluorescent material in a body of water;
> B. the beam causing means comprises at least one collimating lens;
> C. the detecting means includes means for performing spectral analysis of said electrical signal and means for determining the value of the spectral component of said electrical signal corresponding to said modulating frequency; and
> D. said detection system is arranged to determine the level of fluorescent material present in said body of water depending on said value of said spectral component.

Thus, Hjertman et al. fails to disclose, teach or suggest at least the presently claimed features of *[a] fluorometer for detecting the level of fluorescent material in a body of water*, the fluorometer comprising:

> an excitation system including an excitation source… *comprising one or more light emitting diodes (LEDs)… means to cause said excitation light to form*, in use, *a* generally conical *divergent beam* projecting from the fluorometer, *said beam causing means comprising at least one collimating lens*
>
> …
>
> said *detecting means including means for performing spectral analysis of said electrical signal and means for determining the value of a spectral component of said electrical signal corresponding to said modulation frequency*,
>
> wherein *said detection system is arranged to determine the level of fluorescent material present in said body of water depending on said value of said spectral component*, such that the fluorometer is capable of detecting fluorescent material located remotely from the fluorometer in said body of water.

Emphases added.

Accordingly, Applicant respectfully submits that Hjertman et al., whether taken alone or in combination with the Examiner's assertions, fails to teach, disclose or suggest *each and every* feature of the presently claimed subject matter, as required by *In re Wilson* and that the Examiner has failed to make a *prima facie* case of obviousness.

As <u>all</u> of the features of independent claim 1 are not disclosed, taught or suggested by the cited art, the presently claimed subject matter cannot be rendered obvious by the cited art. Similarly, as the dependent claims necessarily recite all of the features of the independent claim

from which they depend, the claims that depend from independent claim 1 are likewise asserted to be patentable over the cited references. Therefore, it is submitted that independent claim 1 and all the claims depending therefrom (claims 4-6, 8, 9, 12, 16, 18, 20-35, 37, 39-41 and 44; and including claims 4, 5, 12, 16, 20, 23 and 41 explicitly rejected herein) are unobvious over the cited prior art of record, whether taken alone or in any combination. Applicants respectfully submit that the dependent claims recite further patentable features. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. 103(a) be withdrawn.

Rejection of claims 6, 8, 9, 18, 21, 22, 27-33 and 35-37

Claims 6, 8, 9, 18, 21, 22, 27-33 and 35-37 depend from independent claim 1. As discussed above, claim 1 is patentable over Hjertman et al. Applicants respectfully submit that none of Bentsen et al., Tokhtuev et al., Früngel et al., Bernstein et al., Chudnovsky, Field, Zielke et al., and Geiger whether taken alone or in combination with each other or Hjertman et al. correct the deficiencies of Hjertman et al. with respect to the above-discussed patentable features.

Applicants reference and incorporate the discussion above. The additional art cited by the Examiner is similarly deficient in failing to teach using an LED light source "to determine the level of fluorescent material… located remotely from the fluorometer in [a] body of water." For example, in Bentsen et al., fluorescence is detected in the *limited area of a sample cell. See* Bentsen et al. col. 23, lines 5-33. With regard to Tokhtuev et al., the detection region is *immediately in front* of the optical module, as can be seen from Tokhtuev et al. Figure 2. In Früngel et al., no range is explicitly mentioned but the technology is similar to that disclosed in other Früngel et al. patents, for example, U.S. Patent No. 4,178,512 which is only capable of detecting fluorescence within a few *inches* of the detector. Thus, the prior art is deficient in teaching, disclosing or suggesting, *inter alia*, the features of "an excitation system including an excitation source… *comprising one or more light emitting diodes (LEDs)... to determine the level of fluorescent material present in said body of water...located remotely* from the fluorometer" as claimed (emphases added).

Claims 6, 8, 9, 18, 21, 22, 27-33 and 35-37 are patentable at least for their dependency from a patentable independent claim; furthermore these claims have patentable features *per se.* Applicants respectfully request reconsideration and withdrawal of these rejections.

Rejection of claims 24-26, 39, 40 and 42

Claims 24-26, 39 and 40 depend from independent claim 1. Claim 42 is an independent claim reciting features discussed above with respect to claim 1 as patentable over Hjertman et al.

Applicants respectfully submit that Kolber et al. fails to correct the deficiencies of Hjertman et al. discussed above. Specifically, Kolber et al. also fails to disclose, teach or suggest "[a] fluorometer for detecting the level of fluorescent material in a body of water, the fluorometer comprising: an excitation system including *an excitation source… comprising one or more light emitting diodes (LEDs)…* wherein *said detection system is arranged to determine the level of fluorescent material present in said body of water depending on said value of said spectral component*, such that the fluorometer is capable of detecting fluorescent material located remotely from the fluorometer in said body of water" as presently claimed (emphases added).

In contrast, Kolber et al.'s embodiments (Figures **5I** and **5J**) that are intended to detect fluorescence at distances of up to several meters from the fluorometer, a *laser* excitation source is used, which results in a very narrow detection area from where it can be seen that the excitation light is focused to a point. Thus, Kolber et al. also fails to correct the deficiencies discussed above of none of the cited prior art teaching, disclosing or suggesting, *inter alia*, "an excitation system including an excitation source… *comprising one or more light emitting diodes (LEDs)… to determine the level of fluorescent material present in said body of water…located remotely* from the fluorometer" as claimed (emphases added).

With reference in particular to claims 39 and 40, Applicants respectfully disagree with the Examiner's assertion that Hjertman et al. is capable of measuring fluorescence at a distance of up to several meters. Firstly, as described above in regard to claim 1, Hjertman et al. does not *measure* fluorescence (i.e. "level of fluorescence"). Instead, Hjertman et al. detects *changes* in

the frequency of the reflected radiation caused by fluorescence (but does not actually attempt to measure the *quantity* of fluorescence). As discussed above, the detection system of the fluorometer of claim 1 allows the fluorometer to detect fluorescence at a distance of up to several meters from the fluorometer and Hjertman et al. does not disclose, teach or suggest such a detection system.

With regard to Kolber et al., Applicants respectfully disagree that Hjertman et al. could be modified by Kolber et al. in the manner suggested by the Examiner. For example, although Kolber et al. attempts to detect fluorescents at distances of up to several meters, Kolber et al. uses a laser as the excitation light source. *See* Kolber et al. col. 15, lines 27-42.

Hjertman et al. also contemplates the option of using a laser as the transmission source. *See* for example Hjertman et al. col. 10, lines 24-26. Thus, if for any reason one having ordinary skill in the art wished to modify Hjertman et al. to increase the distance of detection (i.e. "such that the fluorometer is capable of detecting fluorescent material located remotely from the fluorometer," as claimed) then, if Kolber et al. is applied, in accordance with the teaching of Kolber et al., a *laser* excitation source would be used and not LED's (in contrast to the claimed subject matter).

Applicants also respectfully disagree with the Examiner's assertion that Hjertman et al. modified by Kolber et al. would make Hjertman et al. useful in measuring leaks in a container at large distances away from the fluorometer. As discussed above, Hjertman et al. does not measure quantities of fluorescence and so could not be used to measure leaks in a container using fluorescence. Instead, Hjertman et al.'s transmitter **6** and receiver **8** are *merely* used to recognize markers on the label **5** on a container surface.

With regard to claim 42, the same comments apply as were made in relation to claim 1, *mutatis mutandis*. In addition, Applicants disagree with the Examiner's assertion that Hjertman et al. is capable of measuring fluorescence at distances of up to several meters, firstly because Hjertman et al. does not measure fluorescence and secondly because there is no indication that Hjertman et al.'s detection system could detect radiation at distances of up to several meters.

Applicant also respectfully disagrees that Hjertman et al. could be modified by Kolber et al. in the manner suggested by the Examiner in order to have *LED* excitation light reach further distances. As discussed with respect to claims 39 and 40, Kolber et al. achieves this using a laser excitation source (Kolber et al. col. 15, lines 27-42 and Figures **5I** and **5J**) and so the teachings of Kolber et al. would only motivate or lead one having ordinary skill in the art to choose a (tried, preferred and recommended) *laser* excitation source <u>and not LED's</u> (as claimed in the instant application) when trying to reach further distances.

Thus, Applicants respectfully submit that claims 1 and 42 are patentable over Hjertman et al. and Kolber et al., whether taken alone or in combination. Accordingly, Applicant respectfully submits that the cited references, whether taken alone or in combination, fail to teach, disclose or suggest *each and every* feature of the presently claimed subject matter, as required by *In re Wilson* and that the Examiner has failed to make a *prima facie* case of obviousness.

As <u>all</u> of the features of the independent claims are not disclosed, taught or suggested by the cited references, the presently claimed subject matter cannot be rendered obvious by the cited references. Similarly, as the dependent claims necessarily recite all of the features of the independent claim from which they depend, the claims that depend from independent claims 1 and 42 are likewise asserted to be patentable over the cited references. Therefore, it is submitted that independent claims 1 and 42 and all the claims depending therefrom (claims 4-6, 8, 9, 12, 16, 18, 20-35, 37, 39-41 and 44; and claim 43, respectively) are unobvious over the cited prior art of record, whether taken alone or in any combination. Applicant respectfully submits that the dependent claims recite further patentable features. Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. 103(a) be withdrawn.

<u>Rejection of claims 35 and 43</u>

Claim 35 depends from independent claim 1. Claim 43 depends from independent claim 42. As discussed above, claims 1 and 42 are patentable over Hjertman et al. and Kolber et al.

Applicants respectfully submit that Michael and Früngel et al., whether taken alone or in combination with each other or Hjertman et al. and/or Kolber et al. fail to correct the deficiencies of Hjertman et al. and Kolber et al. with respect to the above-discussed patentable features. Claims 35 and 43 are patentable at least for their dependency from respective patentable independent claims; furthermore these claims have patentable features *per se.* Applicants respectfully request reconsideration and withdrawal of these rejections.

New claims 44 and 45

Newly presented claim 44 depends from claim 1. As discussed above, claim 1 is patentable over the cited art of record. Claim 44 is therefore patentable at least for its dependency from a patentable independent claim; furthermore this claim recites further patentable features *per se.* Applicants respectfully request an early indication of allowability.

Newly presented independent claim 45 recites "[a] method of determining the level of a fluorescent material in a body of water remotely from a fluorometer…." As such, claim 45 is the *method* counterpart to and recites patentable features discussed above with respect to *device* claims 1 and 42. Applicants respectfully submit that claim 45 is similarly patentable over the cited art of record, for the reasons discussed above *mutatis mutandis*, and respectfully request an early indication of allowability.

CONCLUSION

In light of the foregoing, Applicant submits that the application is in condition for allowance. If the Examiner believes the application is not in condition for allowance, Applicant respectfully requests that the Examiner call the undersigned.

In the event this paper is not timely filed, Applicant petitions for an appropriate extension of time. Please charge any fee deficiency or credit any overpayment to Deposit Account No. 14-0112.

Respectfully submitted,

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